
APPENDICES

APPENDIX A.—SCHEDULE

APPENDIX B.—INSTRUCTIONS TO SPECIAL AGENTS

APPENDIX A.

SCHEDULE.

Name of company
 State City.....
 General offices at

UNITED STATES CENSUS OFFICE,
 Washington, D. C., October 15, 1902.

By section 7 of the Act of Congress for the establishment of a permanent Census Office, passed March 6, 1902, the Director of the Census is required to prepare a report on electric light and power of the United States, and the following schedule has been formulated for that purpose.

Mr. Thomas Commerford Martin, of New York city, expert special agent, is in charge of the electric branch of this inquiry.

The information returned on this schedule should cover the business year of the establishment most nearly conforming to the year ending June 30, 1902. All questions that require a fixed time, such as cash on hand, etc., should be of the date of the last day of the year covered by the report.

WILLIAM R. MERRIAM,
 Director of the Census.

Extract from Act of Congress, March 3, 1899:

SECTION 22. * * * "And every president, treasurer, secretary, director, agent, or other officer of every corporation, and every establishment of productive industry, whether conducted as a corporate body, limited liability company, or by private individuals, from which answers to any of the schedules, inquiries, or statistical interrogatories provided for by this Act are herein required, who shall, if thereto requested by the Director, supervisor, enumerator, or special agent, willfully neglect or refuse to give true and complete answers to any inquiries authorized by this Act, or shall willfully give false information, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not exceeding ten thousand dollars, to which may be added imprisonment for a period not exceeding one year."

CERTIFICATE.

This is to certify that the information contained in this schedule is complete and correct to the best of my knowledge and belief, and it covers the period from....., 190..., to....., 190...

(Signature and official designation of the
 person furnishing the information.)

.....
 (Signature of Special Agent.)

1. Date when this establishment commenced operations.....
2. Character of original organization, whether individual, corporation, municipal, or other form.....
3. Date and character of subsequent changes in ownership or organization....
4. If a consolidated company, give names of constituent companies and dates of consolidation.....
5. If a reorganized company, give name of original company and date of reorganization.....
6. If a subsidiary or leased company, give name and address of controlling company or lessor and date such control began or date of lease.....
7. Character of service (answer yes or no):
 Are lighting.....; commercial or other private.....; streets and other public places.....
 Incandescent lighting.....; commercial or other private.....; streets and other public places.....
 Motor power.....; stationary.....; electric railway.....
 Other service (state kind).....
8. If the corporation or firm is engaged in any business or industry other than that of central station work for electric light or power, state the character of such business or industry, and if conducted in the same or separate plants.....
9. Franchise conditions:
 State the franchise rights under which the company or firm operates, whether charter.....; special act of the state legislature.....; municipal ordinance.....; or by other authority (state kind).....
 Exclusive or competitive franchise.....
 Terms of franchise, if limited as to time or perpetual; if limited, state number of years.....
 What free service, if any, is required as a condition of the franchise.....
 Compensation required for the franchise; form and amount, if any.....

10. CAPITAL STOCK, BONDS, AND DIVIDENDS.

	Number of shares or bonds.	Total par value.
Authorized capitalization—		
Common stock.....		\$.....
Preferred stock.....		
Bonds.....		
Capital stock and bonds issued—		
Common stock.....		
Preferred stock.....		
Bonds.....		
Dividends and interest, if any, paid during the year—		
Common stock, rate.....	amount \$.....	
Preferred stock, rate.....	amount \$.....	
Bonds, rate.....	amount \$.....	

11. COST OF PLANT.

	Cost during the year.	Cost to date.
Land.....	\$.....	\$.....
Buildings.....		
Machinery, tools, and implements within stations.....		
Overhead electric service construction.....		
Underground electric service construction.....		
Lamps, motors, meters, and transformers, wire for use.....		
Supplies of every description on hand not enumerated in the foregoing items.....		
Miscellaneous.....		
Total.....		

12. EMPLOYEES, SALARIES, WAGES, ETC.

CLASSES.	Average number employed during the year.	Total amount paid in wages or salaries during the year.
General officers.....		\$.....
Other officers (managers, superintendents, etc.).....		
Clerks.....		
Foremen.....		
Inspectors.....		
Engineers.....		
Firemen.....		
Dynamo and switchboard men.....		
Linemen, etc.....		
Mechanics.....		
Lamp trimmers.....		
Other employees.....		
Total.....		

CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

Number of employees at specified daily rates of pay.

DAILY RATES OF PAY.	Foremen.	Inspectors.	Engineers.	Firemen.	Dynamo and switch-board men.	Linemen, etc.	Mechanics.	Lamp trimmers.	OTHER DAILY RATES OF PAY.	Foremen.	Inspectors.	Engineers.	Firemen.	Dynamo and switch-board men.	Linemen, etc.	Mechanics.	Lamp trimmers.
\$0.75																	
\$1.00																	
\$1.25																	
\$1.50																	
\$1.75																	
\$2.00																	
\$2.25																	
\$2.50																	
\$2.75																	
\$3.00																	
\$3.25																	
\$3.50																	
\$3.75																	
\$4.00																	
\$4.25																	
\$4.50																	

RATES OF PAY PER HOUR FOR OVERTIME.

13. MISCELLANEOUS EXPENSES.

	Amount.
Rent of stations and line wire supports, conduits, or underground privileges	\$.....
Rent of offices
Taxes
Injuries and damages
Insurance
Ordinary repairs of buildings, machinery, etc.
Amount paid for interest, advertising, office supplies, law expenses, telegraph and telephone service, and all other sundries not reported elsewhere
Total

14. SUPPLIES AND MATERIALS PURCHASED FOR USE DURING THE YEAR.

KINDS.	Unit of measure.	Quantities.	Cost, not including freight.
Supplies:			
Meters			\$.....
Motors		
Transformers		
Incandescent lamps		
Incandescent lamp fittings, sockets, etc.		
Carbons for arc lamps		
Globes for arc lamps		
Hoods, etc., for arc lamps		
Arc lamp repairs		
Poles or other supports		
Wire and cable		
All other supplies (not to include oil, waste, etc.)		

14. SUPPLIES AND MATERIALS PURCHASED FOR USE DURING THE YEAR—Continued.

KINDS.	Unit of measure.	Quantities.	Cost, not including freight.
Fuel:			
Coal			\$.....
Crude petroleum		
Natural gas		
Artificial gas		
Other fuel (state kind)		
Water		
Mill supplies (oil, waste, etc.)		
All other materials		
Rent of waterpower		
Total cost		

Amount of freight, if any, paid on the above

15. INCOME.

SOURCE.	Amount.
Lighting:	
Commercial or private	\$.....
Public
Motor service
Electric railway service
Electric heating
Charging automobiles
All other sources
Total income

Total income for preceding business year

16. POWER PLANT EQUIPMENT.

GENERATING POWER PLANT.	Number.	Total capacity in horsepower.
1. Steam engines:		
500 horsepower and under		
Over 500 horsepower and under 1,000 horsepower.....		
1,000 horsepower and under 2,000 horsepower.....		
2,000 horsepower and over.....		
2. Water wheels:		
500 horsepower and under		
Over 500 horsepower and under 1,000 horsepower.....		
1,000 horsepower and under 2,000 horsepower.....		
2,000 horsepower and over.....		
3. Gas engines.....		
4. Boilers.....		
5. Auxiliary engines for use within plant as accessories, etc.		
Power supplied by other establishments, if any, kind Horsepower.....; name and address of establishment supplying the same		

17. ELECTRIC GENERATING PLANT.

CLASSES.	Number.	Total capacity in horsepower.	Voltage.
Dynamos:			
Direct current, constant voltage.....			
Direct current, constant amperage.....			
Alternating and polyphase current: Number of phases.....			
Boosters.....			
Rotaries.....			

18. State the number of hours of operation per day, if day circuits are not operated.....

19. OUTPUT OF STATION.

Kilowatt hour, average per day.....
Kilowatt hour, total for year.....
Horsepower of current, average per day.....
Horsepower of current, total for year.....

20. LINE CONSTRUCTION.

CLASSES.	AGGREGATE LENGTH IN MILES.	
	Mains.	Feeders.
Lighting and stationary motor service:		
Underground.....		
Overhead.....		
Submarine.....		
Total.....		
Electric railway car service owned by lighting company, if any:		
Underground.....		
Overhead.....		
Total.....		

21. Storage batteries in main power plant:
 Number of cells.....; total capacity in horsepower.....
 Total ampere hour capacity at 5-hour rate of discharge.....

22. SUBSTATION PLANT.

	Number.	Total capacity in horsepower.
Storage battery cells.....		
Total ampere hour capacity at 5-hour rate of discharge.....		
Transformers.....		
Rotary converters.....		
Miscellaneous.....		
23. Transformers: Number in circuit for customers..... total capacity in horsepower.....		

24. ARC LIGHTING.

	Type of lamp.	NUMBER IN SERVICE.		
		Total.	Public.	Commercial or private.
Direct current.....	Open.....			
	Inclosed.....			
Alternating current.....	Open.....			
	Inclosed.....			
All other.....	Open.....			
	Inclosed.....			
Total.....	Open.....			
	Inclosed.....			

Total income for the year from arc lighting:
 Commercial or private service..... \$.....
 Public service..... \$.....

25. INCANDESCENT LIGHTING.

	NUMBER IN SERVICE.		
	Total.	Public.	Commercial or private.
Capacity of lamp:			
16 candlepower.....			
32 candlepower.....			
All other.....			

Total income for the year from incandescent lighting:
 Commercial or private service..... \$.....
 Public service..... \$.....

26. Stationary motor service:
 Number of motors of all kinds.....
 Total capacity in horsepower.....
 Income from motor service..... \$.....

27. Railway motor car service, prices of current to users:
 Price charged per kilowatt hour, indicated at station..... \$.....
 Price charged per car mile..... \$.....
 Price charged per car per day..... \$.....
 Additional price per car mile for trall cars..... \$.....
 Total income for the year from motor car service..... \$.....
 Number of railway motor cars served..... \$.....

28. Other electric service, prices of current to users:
 Character of service.....
 Total income for the year derived from such service..... \$.....

29. METERS ON CONSUMPTION CIRCUITS.

	Number.
Mechanical.....	
Chemical.....	
All other.....	
Proportion of service given by meter rates.....	

APPENDIX B.

INSTRUCTIONS TO SPECIAL AGENTS.

Reports must be secured on Special Schedule No. 2 (Form 8-122) for all electric plants doing a public service business—that is, all plants, whether owned or operated by individuals, companies, corporations, or municipalities, established for the purpose of generating electric current for sale, that were in existence during any portion of the year ending June 30, 1902.

Isolated plants doing incidentally a central station business and deriving revenue from the sale of electric current must be reported. No report, however, is required for isolated plants operated for the exclusive benefit of the owner.

Each agent will be furnished with a list giving the names and addresses of all central electric plants in the territory assigned him, which were in existence or building during the year ending June 30, 1902. This list has been prepared from technical journals, electrical directories, etc., and, therefore, can not be accepted as complete. The agents must be constantly on the alert to discover other plants. They must make careful inquiry at each city and town they visit for electric plants located in that vicinity. If such plants are discovered and they are located in the territory assigned the agent, he should proceed to secure returns for them under the same conditions that reports are secured from other plants. In forwarding the reports for new plants, the agent must call attention to the fact that the name of the plant does not appear on the list furnished him.

In some instances the companies named on the office list had not commenced the actual construction of the plant at the time the list was prepared. Such establishments are designated as "proposed." No returns are to be secured for establishments of this character, unless the plant has since been constructed, and where this is the only establishment located in a place, the agent will not be required to visit that place for the purpose of securing the report. The names of proposed establishments are given so as to enable the agent to have in his possession all of the obtainable information concerning electric plants located in his territory.

The agent is required to visit the different cities and towns in the order in which they are named on the list, unless he finds that railroad connections and local conditions make a change necessary. In such cases, the conditions and character of the change must be given on the agent's daily report.

In all cases where an annual report of the plant is printed, a copy of the latest report should be secured and forwarded with the schedule. Copies should also be returned of the latest reports of the directors or officers of the plant, or other printed matter that would add to the information contained in the schedule.

In case an electric plant is owned by a company with an office in another locality, outside the territory of the agent, and it is impossible to secure a complete report at the plant, the agent should complete the schedule as far as possible from the data obtainable, and forward it to the Census Office with a full statement of the facts, giving also the names and addresses of the persons from whom further information may be obtained.

All entries in the schedule must be made clearly and neatly in ink. Amounts and values must be obtained from book accounts,

if such accounts are available. Each question is to be answered. If any question is found not applicable and no amounts are reported, write the word "None."

An exact answer to each item enumerated in the several questions is what is required, and is what should be given if it can be secured with a reasonable amount of labor. It is anticipated, however, that in a number of plants the accounts are not kept under just such a series of items as has been enumerated. If a general account is kept for two or more different services, the expenses should be equitably apportioned among such services. If the accounts cover two or more of the items enumerated for any of the inquiries, a similar proportion should be obtained for the reply to each. In all cases where the answers are estimated, the amounts must be preceded by the word "Estimate."

The cover of the schedule must be left blank, as the name of the establishment is to be supplied after the receipt of the report at the Census Office.

Central electric stations are sometimes operated in connection with other industries such as waterworks, gas works, manufacturing, mining, or street railways. In such cases a specific statement of the facts must be made in answer to Inquiry 8. If the system of accounts used by the company will permit of the preparation of a separate report for the electric light and power plant, a separate return should be obtained; but, if in such case the power plant is conducted in connection with a street railway, and the system of accounts will not permit of the preparation of separate returns, a report should be secured for the entire plant on the schedule for street railways (Form 8-120), and a report must also be secured on the schedule for electric light and power (Form 8-122), answers being given to questions 1 to 9, inclusive, and 15 to 29, inclusive, or such of them as are applicable to the plant reported.

In cases where the electric plant is operated in connection with any business other than that of street railways and the system of accounts will not permit of the preparation of a separate return, careful estimate must be prepared for answer to all the questions contained in the schedule (Form 8-122); these estimates must be prepared by, or submitted to and approved by, the person furnishing the information. The items of capital, employees, wages, cost of materials and supplies, miscellaneous expenses, and income, must pertain only to the electric light and power station.

In cases where two or more central power plants are owned by one individual, company, or corporation, and located in the same city or town, separate reports should be secured for each plant if the systems of accounts will permit of the preparation of separate returns. Otherwise, one schedule may be made to cover the operation of all the plants, but in such cases the number of separate plants included in the report should be stated in answer to Inquiry 4.

Give, on page 1, the name, location, street and number, and post office address of the establishment, and obtain the signature and official designation of the person furnishing the information. The period covered by the report must be shown in the certificate. If the address of the general or business office is at a different place from that of the plant, give both.

INQUIRY 1.—DATE WHEN THIS ESTABLISHMENT COMMENCED OPERATIONS.

Give the date, if obtainable, when the original establishment commenced operations, which will not necessarily be the date when the present owners assumed control.

INQUIRIES 2 TO 6, INCLUSIVE.

These are intended to obtain information concerning the character of the organization under which the company is operated, and the date and character of the changes in such organization. The answers given to each of these questions must be consistent.

INQUIRY 7.—CHARACTER OF SERVICE.

By commercial service is meant the service to business houses, hotels, office buildings, etc.; private service relates to residences. By public service is meant the service for all public uses, and for which the municipality or other government pays, such as the lighting of streets, parks, municipal buildings, etc. Lights in front of buildings or stores, when paid for by the owner or tenant, must be considered as "commercial or other private" service. The inquiries are to be answered by "Yes" or "No."

INQUIRY 9.—FRANCHISE CONDITIONS.

For the purpose of this investigation the word "franchise" is understood to mean any legislative permit giving authority for the carrying of lines of wire over or under, along or across, the streets of the municipality, or any legislative or official permit necessary to the establishment of the company. If the company is organized under a general act of the legislature, the date of the passage of such act should be given. In such cases give also the date and character of the municipal ordinances or other privilege which may have been granted the company. The answer to the first section of this inquiry will be "Yes" or "No." A competitive franchise is one that permits the granting of a franchise to another company to occupy the same territory for the same purpose. Describe the terms of the franchise in a separate memorandum, which must be attached to the schedule. If free service is required as a condition of the franchise, it should be described and an estimate given of the amount that would be received for corresponding service, if paid for.

INQUIRY 10.—CAPITAL STOCK, BONDS, AND DIVIDENDS.

Account for the entire amount of common, preferred stock, and bonds, respectively, authorized, the amount of each issued up to the end of the year for which the report was made, giving the number of each class, the par value, and the full amount of dividends paid during the year.

INQUIRY 11.—COST OF PLANT.

The answer to this inquiry must show the total cost of the plant up to the end of the fiscal year for which the schedule is made, with a separate statement of the cost of additions and extensions during the year. The cost must include all expenses incident to the organization of the company and the establishment of the plant. If the accounts are not kept so as to show the cost of each item named under the inquiry, ascertain the total cost and apportion this among the several items according to the best judgment of the person furnishing the information. If the total or any of the items are estimated, they should be marked with the word "Estimate." Amounts paid, if any, for the franchise should be included under "miscellaneous." If land was donated, that fact should be stated and the estimated value at the time of the donation given.

INQUIRY 12.—EMPLOYEES, SALARIES, WAGES, ETC.

Account for all persons employed by the company, both in the management and in the operation of the plant. Give the number of officers who receive salaries (not the number of stockholders),

and the gross amount of their salaries. Report separately the number and wages of dynamo men, linemen, and other classes of employees specified. The salaries and wages should include board or rent furnished as part compensation. The average number employed during the year is the number that would have continuous employment for the 12 months. There should be no difficulty in securing this information for the plant of ordinary size, but it may be that the large companies keep an itemized pay roll, the total only being carried forward from each week or month. In such cases it will be necessary to either add the pay roll of each week or month, for each class of employees, or compute the aggregate for each class, using a pay roll for a representative week or month, as the base. Results obtained by the latter method will be accepted.

Number of employees at specified daily rates of pay.—This inquiry is designed to ascertain the number of employees for each of the 8 classes enumerated that receive the daily rates of pay specified. If there are other daily rates, enumerate them and give the number employed at each, also give the hour rates for overtime for each of the 8 classes.

INQUIRY 13.—MISCELLANEOUS EXPENSES.

All items of expense incident to the business for the year and not included in answer to Inquiries 12 and 14 must be reported here. Do not include any portion of the freight reported under Inquiry 14 as paid on materials and supplies. Expenses incident to additions or extensions of the plant or line should not be included in answer to Inquiries 12, 13, or 14. The cost of such additions must be reported as cost of plant—Inquiry 11.

INQUIRY 14.—SUPPLIES AND MATERIALS PURCHASED FOR USE DURING THE YEAR.

The actual cost of all materials and supplies must be reported. Give the cost, exclusive of freight charges, and then the total freight paid. If this is not practicable, give the cost including the freight charges, and state that such charges are included. In answering this inquiry report only the materials and supplies that were used for ordinary repairs or replacement during the year reported. Expenditures for additions to the plant, such as new machinery, additional lines on which new meters, motors, or transformers, or lamps are installed, should be included in answer to Inquiry 11—Cost of Plant. Quantities should be given when possible, and the unit of measure stated, as "number," "pounds," "tons," "feet," etc. Opposite "mill supplies" give the cost of oil, waste, and other supplies consumed in the running of machinery. If large quantities of fuel were purchased with a view of taking advantage of low prices, that fact must be stated in a footnote, and the total quantity and its value given; but in such case, the answer to the inquiry should be the quantity consumed during the year.

INQUIRY 15.—INCOME.

The total amount of income indicated by the books of the company for the entire year should be reported. Give separate amounts for the different sources indicated. Give also the total income for the preceding business year.

INQUIRY 16.—POWER PLANT EQUIPMENT.

These are details that should in every instance be readily obtainable. If the manager or superintendent does not know the capacity of his boilers, he will probably know that of his engine or of his dynamo, and all are closely related. The boiler capacity is almost invariably installed larger than the engine requires, and the engine has always a margin of more power than the dynamo calls for. Thus, a dynamo of 150 horsepower may be driven by an engine of 175 horsepower, and the engine may be supplied with steam from a boiler that can furnish 200 horsepower. "Auxiliary engines" will sometimes be found in small plants, but in the larger plants they or electric motors are in common use to drive pumps, etc., and the superintendent or manager can readily enumerate them.

INQUIRY 17.—ELECTRIC GENERATING PLANT.

Direct current constant voltage dynamos or generators are used chiefly for incandescent lighting and for motor service. Voltage means *pressure or force*. The requirement for this service is a current of low but constant *pressure or force* of current in one direction. The *amperage* of the current, or the quantity, is usually large and may be variable.

Direct current constant amperage generators are used chiefly for arc lighting. The requirement for this service is usually a current of small but continued quantity in one direction. The voltage of the current from such machines is usually very high.

Polyphase current or alternating current generators are used chiefly for long distance distribution. Alternating current flows alternately in opposite directions and is rapidly reversed. The current is sent over the primary lines at a very high voltage and is modified by passing through a "transformer," to be reduced to a safe pressure before being applied to the practical work of operating lamps, motors, or other devices. A transformer of some kind is almost always used with an alternating current. Polyphase alternating currents are now coming into use, and hence the machines which are not single phase alternating will be either two phase or three phase. If the current delivered to the customer from these machines is to be "direct current," it passes through "rotary converters," as well as through the "transformers." (See Inquiry 23.)

INQUIRY 18.—HOURS OF OPERATION.

The object of this inquiry is to ascertain the number of hours each day that the station is in operation. If day circuits are operated the presumption is that the station is in operation during the entire day of twenty-four hours. A great many of the small stations are likely to be found, however, which are run only at night, for lighting purposes, and which have no "day load" of motors, street cars, etc., requiring current during daylight hours. Hence the plant stands idle except during the hours of lighting.

INQUIRY 19.—OUTPUT OF STATION.

This is an inquiry in regard to which some plants may have no data, although in many of them it is a matter of careful scientific accounting. In every case the volts multiplied by the amperes will give the number of watts. A kilowatt is 1,000 watts. There are 746 watts in the old familiar horsepower, so that a kilowatt is roughly $1\frac{1}{3}$ horsepower. Watt hours are the product of watts multiplied by the number of hours during which the current is in use. Thus, a power house with a dynamo delivering current to the line of 1,000 amperes at 550 volts pressure is generating 550,000 watts, or 550 kilowatts. If these 550,000 watts are furnished on an average twenty hours daily, we get 11,000,000 watt hours, or 11,000 kilowatt hours. The total for the year can be arrived at from the daily total, and the horsepower of current can be figured from the kilowattage, or vice versa, by the simple calculation above given.

INQUIRY 20.—LINE CONSTRUCTION.

A main wire is one leading from the feeder wires, covering the area over which the service is distributed. A feeder wire is one leading from the generating plant to a point some distance from the station, where it is connected with the main wires. Its purpose is to supply the current to the main wires, drawn off by service wires, so there may be a number of feeder wires, one reaching beyond another. A service wire is one connecting the main wire with lamps, motors, or other devices to be operated.

In the case of "electric railway car service" a few instances may be found where the lighting company supplying electric current for the operation of the railway owns some or all of the main and feeder wires. Generally, however, it will be found that these wires are owned by the railway company. In that event no account should be taken of them in giving data for the lighting company.

Underground conduits are generally owned by the lighting companies. There are, however, a few instances in which they are owned by an underground conduit company, or by the municipality. In these cases the lighting company hires the use of ducts through which its mains and feeders are drawn. In such cases the amounts paid out for this accommodation by the lighting companies form an important factor in determining the price to be charged for the service. It is required, therefore, that a complete statement be obtained from lighting companies paying rent for underground conduits, showing all the conditions and charges imposed upon them by the owners of the conduits. If there is not sufficient space allowed in the schedule to state the facts fully and clearly, an extra sheet of paper may be used and pinned to the schedule.

INQUIRIES 21 AND 22.—STORAGE BATTERIES—SUBSTATION PLANT.

The object of these inquiries as to batteries is to ascertain the number of hours each day that the battery is available. An ampere is an electric unit of quantity. The volume of an electric current is always stated in amperes, so that an ampere hour is one ampere of current supplied for one hour. Storage batteries, which consist of sets of lead plates in a solution of sulphuric acid, are usually rated by their five-hour discharge of the current stored in them, and hence their output is spoken of in terms of ampere hour capacity at the five-hour rate of discharge, and also in terms of horsepower capacity. The current, like water from a tank, might all be drawn out in one hour, or its supply, taken off occasionally in smaller quantities, might be made to last for weeks; hence the desirability of the adoption of the five-hour rating as a standard period during which the battery is in service to return the available quantity of the current with which it was charged as a reservoir by the generating plant. Storage batteries are used in the main stations and frequently in substations. The part they play is as important as that of the gasometer in the gas industry. While some equipments are very large, others are quite small. The agent is desired to obtain a concise and clear statement as to the factors, economic and otherwise, involved in their use and operation. Governors and other machines used in connection with the generation or distribution of the current should be reported under "miscellaneous," Inquiry 22. In this inquiry "storage battery" means each "cell," and each station battery will usually contain a number of cells, say from 50 or 75 upward.

INQUIRY 23.—TRANSFORMERS.

A great deal of electric work in scattered communities is done with the aid of transformers, which are also to be found in some of the larger cities at the customer's end of the line, although as a general thing in large city plants it is the practice to furnish direct current to the consumer, in which case transformers are not needed outside the station or substation. Where the lamps in a customer's house or store are fed with alternating current, the transformers are placed on an adjacent pole or in a cellar or other room where they are not free of access, as the primary voltage is dangerous to life. The current is sent out at a high pressure from the central station to them, and is received by the primary coil in the transformer at, say, 1,000 or 2,000 volts. The secondary coil takes the small quantity high pressure current from the primary coil, and transforms it into large quantity low pressure current for use in the lamps, motors, etc. The coils and the iron core they surround are inclosed in water-tight metal boxes, and they present, roughly, a resemblance to mail boxes and fire alarm boxes.

INQUIRY 24.—ARC LIGHTING.

Open arc electric lamps are usually employed in street lighting, and are those having the pair or two pairs of carbons inclosed in a single large globe. They are designed to burn a small number of hours (ten to fifteen) before having the carbon renewed. An inclosed arc lamp has two globes, a large or outer one inclosing a

small one in which the single pair of carbons is incased, and is designed to burn a large number of hours (one hundred to one hundred and fifty) before having the carbons renewed. Both kinds may be either of the direct current or of the alternating current type.

For number of each type of lamp in service give the number connected or wired ready to render service, and not the number actually performing service at any one time. The statement should show how many lamps are in position to render service, and therefore to earn an income.

Give total amount received for commercial or private service and public service, respectively. If the incandescent and arc lamps are connected on the same meter, and it is found impossible to separate the income, the total income for both classes of service should be ascertained and a careful estimate made for the separate income, the income from the incandescent service being reported in answer to Inquiry 25. The total for both classes of service will be given in answer to Inquiry 15. This public service is the lighting of streets, parks, public buildings, and all other public places for the illumination of which the municipality or other government is responsible. Public lighting contracts are usually made for a term of years. The customary contract is based on what is known as a lighting schedule. Two principal schedules, which show the extremes, are designated by business men, respectively, as the "all-night-and-every-night schedule," estimated at 4,000 hours per year, and the "dark-of-moon, every night, one-hour-after-sunset-until-12-o'clock-midnight schedule," estimated at 1,200 hours per year. Between these extremes are numberless variations. The income received from public service, therefore, can be very easily ascertained. If this income for arc lighting and incandescent lighting is not shown separately, the separation should be estimated in the same manner as indicated for arc lighting and incandescent lighting.

INQUIRY 25.—INCANDESCENT LIGHTING.

The total number of the different varieties of incandescent lamps used for public and private service, respectively, should be reported. If the exact number can not be ascertained, a careful estimate will be accepted. Such lamps are almost invariably of the 16-candlepower type, although some 32-candlepower and others of larger illuminating power are in general use. Smaller candlepower lamps are also used for sign and decorative purposes.

INQUIRY 26.—STATIONARY MOTOR SERVICE.

This term is applied by central station men to electric motors that are permanently located at one point, as distinguished from electric railway motors on cars. Such stationary motors will include an infinite variety of work, and in many cases the companies will have difficulty in reporting the number of motors on their circuits, or in giving the separate income from motors, especially where current is furnished through meters. But the inquiry must be pushed, and where exact figures can not be given from records, it is desirable that a close estimate be secured. These stationary motors will include every class of industrial work and many other varieties of application, such as fans, elevators, etc. It is a custom of many companies to make special rates for what they call "power" business, as distinct from that done in supplying current for lamps; and where this is the case, their records should show the data as to motor service and income.

INQUIRY 27.—RAILWAY MOTOR CAR SERVICE.

Several instances will be found in which an electric lighting company is supplying current to an electric railway company. It is believed that usually the main and feeder wires for the current are owned by the latter; but sometimes they are owned by the

former, in which case the lighting company should be credited with them (see Inquiry 20). If the street railway company is the owner, these wires will be included in the separate return for that company. The facts in the case can be ascertained by a simple question on the subject.

In many instances the lighting and street railway properties are owned and operated by one company. Sometimes the lighting plant or the street railway system is operated under a lease. The separate lighting and street railway forms provide for such a contingency.

The terms upon which electric light plants furnish current for cars are various, but it is believed that all are provided for in the inquiry. It will be seen that one method is that of charging for the actual current used as shown by the meter. In this case the lighting company will have official records showing the consumption. It would seem that in the other instances of charges per car per day, or per car mile, a system of averages will prevail, and the special agent must endeavor to secure an intelligent report on this point. In all cases the amount of income must be secured from the books of the company, even if the other figures require estimating or are deduced from the other items.

INQUIRY 28.—OTHER ELECTRIC SERVICE.

The great bulk of the work done by an electric lighting company consists in furnishing current for light and power; but there are other uses, for some of which special prices are often made. These uses will include electro-chemical, electro-metallurgical, electroplating, electric welding, electric heating, and other branches. This inquiry will develop many interesting local peculiarities of demand and supply, in regard to which the fullest information is sought.

INQUIRY 29.—METERS ON CONSUMPTION CIRCUITS.

This inquiry has nothing to do with the meters installed at the central station, and applies solely to meters installed on the consumer's premises, just as gas meters are. For the purposes of this investigation, the meters have been divided into two broad, main classes; one mechanical, the other chemical. In the former, the current actuates, electro-mechanically, an escapement or train of gear wheels, and registration is effected. In the chemical class, a deposit of metal is usually effected in a cell by the action of the current and the amount of current used is ascertained by measuring or weighing the metal deposited, month by month. These meters are also called "electrolytic." It is believed that most of the instruments found on consumers' premises will be of what is known as the "recording wattmeter" type. These should be counted as mechanical meters. Edison meters, so called, are of the chemical electrolytic type, but a great many Edison companies either do not use them or else use large numbers of the mechanical meters as well.

MUNICIPAL PLANTS.

Schedule No. 2 (Form 8-122) is prepared for plants owned by individuals, companies, or corporations. In applying this schedule to plants owned and operated by municipalities, certain changes will be necessary. These changes should be made by the agent, and additional information, when required, must be given on a separate sheet of paper and securely fastened to the schedule. It will often occur that the administration of a municipal plant is assigned to a public officer or officers performing other duties, or that a part or all of the labor of collecting and accounting is done in the office of some other department—waterworks, for example. In such a case this should be stated and a fair proportion of the salary of the officer and of the office expenses where this work is

done should be entered on the schedule and considered as the expense of the electric plant.

INQUIRY 11.—COST OF PLANT.

The installation of municipal plants is frequently attended by a preliminary cost for expert reports, engineering plans, specifications, printing, advertising, holding a special election, traveling inspection by a special committee, etc., which would not, under ordinary circumstances, be included in the cost of the plant. Care must be taken in all cases of this character to attach a memorandum to the schedule giving the answers to the following questions:

Preliminary cost of plant:

Engineering plans, specifications and information.....	\$.....
Printing, advertising, and legislation.....
Holding special election or additional cost of general election.....

INQUIRY 12.—SALARIES, WAGES, ETC.

If a general account is kept for two or more different services, such as water, streets, etc., the expenses for the electric plant should be equitably apportioned among such services. The following plan is suggested to aid in arriving at an equitable apportionment of the salaries, wages, and miscellaneous expenses: For officers, clerks, and all employees, charge to each service such a part of the total amount paid as the time devoted to that service is a part of the whole time worked; for rent and all sundry office expenses, in proportion to the income of each service; for insurance, taxes, law, depreciation, interest on bonds or floating debt, and all contingent expenses, in proportion to the amount of investment; for fuel, water, and all other power expenses, in proportion to the horsepower utilized by each service.